INTERNET PET TRACKING SYSTEM

This application claims the priority of United States Provisional Application Serial No. 60/153,350 filed on September 10, 1999, entitled ***Multi-User Global Position Tracking System and Method*** and 09/497,733 filed on February 4, 2000, entitled ***Multi-User Global Position Tracking System and Method*** which applications are hereby incorporated in this disclosure by reference.

Background of the Invention

The invention relates to a system and method for locating lost or stolen pets.

The United States, in particular, is a pet-based society. Large numbers of pets are lost or stolen from owners every year. The problem of lost or stolen pets is a problem which needs considerable attention because of the large number of pet owners in the United States, and foreign countries. In particular, the loss of valuable show animals is a problem needing attention, but even household pets are cherished by their owners. In particular, there is a problem of locating lost pets by owners who lose their pets while traveling on trips during vacations, or when traveling to competitive pet shows. Unlike a lost child or person, a pet cannot ask for help when lost, and a system and method which is completely passive, as far as the pet is concerned, is needed. While different types of devices, such as identification tags,

have been used in the past to meet the problem of lost pets, these have not been entirely satisfactory and usually require the assistance of an individual.

Accordingly, an object of the invention is to provide a system and method for locating lost or stolen pets.

Another object of the invention is to provide a system and method for locating lost show animals and the like.

Still another object of the invention is to provide a system and method wherein large numbers of pets can be concurrently tracked if lost or stolen from owners so that attempts can be made to find the pets.

Summary of the Invention

The above objectives are accomplished according to the present invention by providing a web host connected to the Internet, or other wide area web network, wherein the web host is accessible to a subscriber. A computer program is stored on the web host for connecting the subscriber to the network, and a unique location unit is provided which can be secured to the pet. The location unit preferably includes a GPS chip for calculating the position of the pet. The location unit includes a processor for accessing location data calculated by the GPS chip. A transceiver included in the unit is controlled by the processor to automatically answer a tracking call from the web host, transmit location data representing the current position of the pet back to the web host, hang up, and return to standby. Any one of a number of pet owners or subscribers may concurrently send tracking requests to the web host

wherein the web host automatically sends out tracking calls to each identified pet/location unit, receives the current locations of the pets from the location units, and transmits location data to the subscribers for display at the subscribers' computer terminals. The location unit may be advantageously made integral with a special pet collar or affixed to an existing pet collar "Internet tracking collar,". It may also be desirable to make the collar/unit difficult to remove.

The pet tracking and anti-theft system and method uses cutting edge technology with GPS and wireless web design. The collar location unit may read its location off of GPS satellites periodically, e.g. every 15 seconds, and keep the last location in memory. When one goes online to locate a pet, the web host contacts the collar and pinpoints its exact location on a map, all in less than two minutes. Since GPS cannot track inside a building, if a pet goes or is taken inside, the web host will contact the collar unit and draw a map taking one to the front of the building where the pet is. No installation is required. The collar unit may be integrated into or affixed to the existing pet collar. For example, a housing, in which the electronics are enclosed, may include spaced end slots through which the collar is threaded, or velcro fasteners may be used.

Description of the Drawings

The construction designed to carry out the invention will hereinafter be described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

Figure 1 is a schematic view illustrating a pet tracking system according to the invention;

Figure 2 is a schematic illustration of a wireless location unit and system for use in a pet tracking system according to the invention;

Figure 3 is a process flow diagram illustrating a pet tracking system according to the invention wherein a network subscriber can access a web host for tracking a lost or stolen pet;

Figure 4 is a schematic diagram of a web host and computer program for a pet tracking system according to the invention;

Figure 5 is a schematic diagram of the modules contained with the computer program residing on the web host of a pet tracking system according to the invention;

Figure 6 is a pet collar tracking unit according to the invention; and

Figure 7 is a schematic illustration of a digital data packet containing location data according to the invention; and

Figure 8 is a flow diagram of a computer program for a web host according to the invention.

Description of a Preferred Embodiment

The detailed description which follows is presented in terms of program procedures executed on a computer or a network of computers. These procedural descriptions and representations are the means used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art. A object or module as herein described is generally a self-consistent sequence of steps leading to desired results. These steps are those requiring physical manipulations of physical quantities. Usually, these quantities take the steps of electrical or magnetic signals capable of being stored, transferred, combined, compared or otherwise manipulated. More specifically, an object or module is a section of computer readable code which is designed to perform a specific task or tasks. Actual computer executable code need not be contained with one file or one storage medium to constitute an object or module. Objects or modules generally receive input and provide output. The objects or module may receive information passed by another calling object or module and may output information to the calling object. A web host is computer hardware capable of creating and processing computer readable instructions and is not limited to a single computer. For example, mass storage, network communications, and main processing could be executed by three physically separate computers and would still constitute a web host. Therefore, the term "web host" is not intended to be limited to a single computer. Packets are electronic messages or information together with an Internet address which are sent as one unit. A datagram is a complete message and can be sent in many or one

separate packet. With these terms in mind, the preferred embodiment is described in more detail.

Referring to the drawings, an Internet based pet tracking system, designated generally as A, is illustrated for tracking a position of a pet 10 to which a pet location unit 12 is affixed, as can best be seen in of Figures 1 and 6. The term "pet" is used to mean any animal whether a household pet, outdoor animal, livestock, etc. The tracking system includes a web host B connected to the Internet 14, or other wide area network, through a network connection device 15. A computer program C runs on web host B and receives a tracking request from a subscriber or user 16 through the user terminal 17. The web host receives location data from location unit 12 through a cellular network 22 and a modem 20; and makes the location data accessible by subscriber 16 through the subscriber's terminal 17.

As best can be seen in Figure 1, web host connection 13 to the Internet 14 allows a multitude of subscribers 16, for example 16a, 16b, 16c, etc., to simultaneously access web host B. Each subscriber has a connection 18 to the Internet allowing access to the web host. The term "subscriber" means anyone with authorized access to the web host, whether payment is exchanged or not, e.g. any authorized user of the system or method. In addition to a connection with the Internet, web host B has a communication connection 19 for connecting the web host to a modem 20. Modem 20 allows web host B to initiate cellular tracking calls to pet location unit 12. When dialing cellular numbers, modem 20 connects to a cellular network 22 through a phone line 21. The web host can then transmit and receive

data from pet location unit 12 through cellular network 22 allowing for location unit 12 to send location data to web host B.

Pet location unit 12 is further illustrated in Figure 2, as made integral with a pet Internet tracking collar/unit "T." In order to provide the functionality required for a subscriber to track a pet, location unit 12 may be a simple GPS based device using digital cellular communications. Location unit 12 includes a GPS chip 28 carried within an enclosure for reading information from a global positioning satellite system. Global position satellites 36a-36c, generate signals 37 which are received through an antenna 35 of unit 12 and forwarded to GPS chip 28. Any suitable GPS chip may be utilized such as a model Superstar (with antenna), available from Canadian Marconi of Quebec, CN. GPS chip 28 passes the information to a processor 34. Processor 34 then may calculate latitude, longitude, and altitude of the unit and, therefore, of the pet. Once calculated the position information is transmitted to a cellular network 22 by a wireless transceiver 26 using a wireless communication antenna 32. Memory 33 may be included within pet location unit 12 to hold a number of previous GPS readings which can be used to show the prior path or track of the location unit and tracked pet, as disclosed in the above application. Other, non-GPS, location calculating methods and chips may also be utilized. Processor 34 is programmed to control location unit 12 on stand-by, automatically answer a position inquiry from a concerned user, poll the GPS chip and received GPS position information, transmit the position information to the host, terminate the call, and return to stand-by.

Pet location unit 12 can be powered by a stackable power supply 30. Stackable power supply 30 may include stackable thin film batteries as have been recently developed for the cellular market. Since the location unit 12 only receives a tracking request and transmits location data, the power required is significantly less than the traditional cellular phone. With this advantage as well as eliminating the need for voice communication, location unit 12 requires less power and may be a significantly smaller unit than the traditional cellular phone.

The GPS chip creates tracking information 23 which includes the latitude and longitude of locator device A. Tracking information 23 is transmitted via transceiver 26 over lines 24, and may be stored in memory 33. Transceiver antenna 32 transmits the tracking information in the form of location data 104 to remote relay antenna 22. Any suitable transceiver device may be utilized, such as that available from Motorola of Schaumburg, Illinois, Model 650. GPS chip 28 reads the tracking signals of the locator device at any desired interval, such as every 30 minutes. The GPS chip may be adjustable so that the reading interval may be adjusted as desired. The transceiver 26 is on standby at all times. The processor/memory can store a predetermined number of the GPS readings, for example, the previous 100 readings. It is advantageous to store a predetermined number of previous readings in the event a stolen pet is inside a building or other environment in which it is not possible to receive satellite signals and obtain GPS readings. In this case, when the locator unit is called, a trail of the past 2 days positions can be downloaded to the base station to help pinpoint the pet's current location.

When a tracking call 102 is received from the web host in order to determine the pet's location, the transceiver automatically answers the call and activates processor 34. The processor is programed to automatically retrieve the pet's location tracking information stored in the processor chip and transmit location data 104 to web host B. The programming of the processor will be well within the purview of the average artisan in the automatic programming art having been taught the expedients and operation of the present invention. At the web host the digital location data 104 is received by modem 20 wired to computer 38.

In accordance with the invention, digital location data 104 which is output by location unit 12 is in a special format so that low power requirements are needed to transmit the signal. The signal is purely a data signal and contains no voice or sound. Since there is no voice, the unit outputs only a very small digital location data packet. For example, location data 104 may include a small digital data packet 106, containing only protocol data 106a, a unit code number 106b identifying the subscriber/pet to which the locator unit is assigned, longitude data 106c, and latitude data 106d. Therefore low power is required to transmit the data. The high power requirements associated with analog sound and voice transmission of full cellular transmissions are eliminated. For example, transceiver device 32 may only require 0.6, or even 0.3, watts. Means for powering GPS chip 28, processor 34, and transceiver 26 may be provided by a miniature rechargeable battery system designated generally as 30. The rechargeable battery system may be a miniturized, lightweight version of a lithium ion battery and recharging system such as disclosed

in U.S. Patent no. 5,742,233 or may be recently developed thin film battery technology.

While the digital telephone system is preferred, national coverage may not presently exist for digital technology. When national coverage does exist, the digital technology will provide an advanced location system which will have faster and more long distance communication and longer battery life. However, for the present, the wireless communications between the location unit 12 and the web host B may be had using cellular analog transmissions. Cellular telephone systems currently provide national coverage necessary to allow the location device to function on a national basis.

Transceiver 26 remains in a standby, power reducing mode until the web host initiates tracking call 102. The web host sends out the cellular tracking call and the transceiver automatically answers the call, and transmits location data representing the present coordinates to the web host. The transceiver then automatically hangs up and returns to standby. The pet location unit can also transmit previously stored coordinates to the base station as described above. For this purpose, processor 34 may be programmed to send either the current location data, the location history which includes all the stored locations, or any number of the stored locations. The unit may be programmed to send the desired location data depending on a corresponding tracking call request from the web host.

Figure 4 illustrates the basic components of web host program C which accomplishes these tasks. The web host program comprises a set of computer

readable instructions embodied in a computer readable medium located on the web host computer 38. To initiate a tracking call, the program receives a tracking request datagram 60 generated by subscriber terminal 17 sent to web host B. Datagram 60 includes an unique access code 60a and an unique unit code 60b supplied to the subscriber. The program includes an interface module 61 which includes the instructions necessary for terminal 17 to communicate with web host B. Interface module 61 passes request datagram 60 to a process module 64. Processing module 64 includes a set of instructions for receiving datagram 60, validating the access and unit codes, and requesting and receiving the GPS location data for making the same available to the subscriber, as more fully described below.

As best can be seen in Figure 5, processing module 64 includes an input module 74 for receiving tracking request datagram 60. There is a validation module 76 having instructions for receiving the access code and determining if the access code is valid and whether processing can continue. There is a location module 78 which receives unit code 60b for further processing if the processing continues. Location module 78 includes a set of instructions for initiating wireless communication through a wireless communication module 80. Wireless communication module 80 includes instructions for polling pet location unit 12 by making a cellular phone call through modem 20. Connected wireless communication module 80 sends a tracking call datagram 81 which is received by transceiver 26 of pet location unit 12. Wireless communication module 80 also includes the instructions for receiving and processing GPS position data and forwards this data to a format module 82. The format module

includes instructions which create position information 66 and provides a user readable representation of the position of pet 10 such as a map display or position coordinates. A display module 84 includes a set of instructions to create a datagram containing pet position information 66 to be accessed by the subscriber's terminal 17. Network interface module 72 includes instructions for receiving position information 66 and allowing the subscriber to know and/or display the global position of the pet being tracked. Location unit 12 responds to tracking call datagram 81 by determining its global position through satellites 36a-36c (Figure 2) and temporary stores this tracking information. Location data 104 is then transmitted back through modem 20 to wireless communication module 80.

In use, as can best be seen in Figure 3, subscriber 16 can discover the global position of pet 10 by accessing web host B through terminal 17 connected to web host B by the Internet. To do this, the subscriber enters a domain name for web host B such as www.satcel.com in step 40 of Figure 3. When the remote user enters a domain name, a datagram is created at terminal 17 and transmitted across the Internet, from the subscriber to the web host, which contains the Internet addresses of the user. At this point, the subscriber enters a tracking request which includes system access number 60a and a subscriber unit code 60b which is unique to location unit 12. At step 42, a datagram is created containing the subscriber's input and sent to the web host. Upon receiving the remote user's request, the web host initiates communication with the pet location unit at step 44 by initiating a cellular telephone call to the pet location unit. The pet location unit answers the call without

any further action, nor with any notification to the individual in the pet. The web host sends a small compressed digital packet requesting the global position of the pet location unit. Such a packet need only include a single character or two, as discussed above.

Once communication with the pet location unit is initiated, the web host requests location data from the pet unit at step 46. The pet location unit then polls GPS satellites for determining its global position at 48. The GPS satellites transmit the location data and the pet location unit receives the data at step 50. The pet location unit then constructs a packet containing the global location data and sends the packet back to the web host. The web host receives the location data and stores the information at 52 either in permanent or temporary memory. At this point, cellular communication is terminated. At 54, the web host formats the global position of the pet based upon the stored location data. The results of the formatting would be a map display, street address or position coordinates. Once this formatting is complete, the web host makes the global position information available to the subscriber user at 56. The web host, associating the pet location unit number and subscriber's Internet address, constructs datagram 60 (Figure 4) containing the pet's location. This datagram is sent to the subscriber's terminal across the Internet. The subscriber receives the datagram and a display of the global position of the pet is created at the subscriber's terminal. Once the initial map is displayed the user has the option to zoom in or out on the position of the tracking unit. Figure 6 shows a representation of the display at the user's terminal once the pet location unit has

been found. Map 90 shows the global position of the location unit by icon 92. Beneath the map contains geo-coordinates 94 showing latitude, longitude, speed and the heading of the location unit. By using drop-down bar 96, the subscriber can select from displaying the entire United States to displaying the specific location at the street level of the pet being tracked. Figure 7 shows the map of the tracked pet and pet location unit at the street level. While the Internet is the preferred and most expedient method of providing communication between the subscriber and the web host, multi-user networks including Local Area Networks or Wide Area Networks using such communication connections as dial-up, ISDN, Ethernet, token ring, FDDI or other connection methods well known in the art would also provide such a communication connection. Additionally, while cellular communication is the preferred and most expedient method of providing communication between the web host and pet location unit, any wireless communication such as satellites, microwave, or infrared would provide such wireless communication. The location data received by the pet location unit 12 from the GPS satellites 36a - 36c can be converted into the global position of the pet either at the pet location unit itself or the raw position data can be passed to the web site and the global position calculated there. Additionally, position data may be derived from sources other than GPS such as GLONASS, Triangulation, or signal strength determination.

As can best be seen in Figure 6, location unit 12 is preferably concealed within pet tracking collar "T" which is carried by the pet. Preferably, the unit is integrated with a collar portion 110 and encapsulated in a flexible housing 112.

Location unit 12 may also be incorporated in a housing 114 which is then affixed to an existing collar 116. In this manner, the unit may be used with different type collars and/or pets, as needed. In this case, molded-in slots 118 may be utilized to affix the unit housing to a collar such as by inserting or threading the collar through the slots 22. In either case, the housing may be contoured, at 120, to fit around the pet's neck with the collar. In addition, it is also possible that a connection may be made between the pet tracking collar and the pet by using a protection key 25 so that if the pet tracking collar is removed from the pet without authorization, a position signal will be initiated simultaneously. In that case, the protection key is connected between the pet (e.g. by an underlying neck string) and the tracking collar, and is pulled out of the connection when the pet tracking collar is removed. Once key 25 is activated, auxiliary power supply 31 enables location unit 12 to transmit its current GPS location to cellular network 22 , and to the web host and subscriber. If the subscriber is not online, a location message will be displayed the next time the subscriber goes online. Therefore, the subscriber is warned of the current location in the event the key is activated.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.